

- 1 1. A solid-state battery, comprising:  
2 a plurality of stacked thin film layers,  
3 wherein the solid-state battery is at least partially integrated within the stacked layers and  
4 has a thickness less than about 1  $\mu\text{m}$ .
- 1 2. The solid-state battery of claim 1 wherein the stacked thin film layers comprise a cathode  
2 layer, an electrolyte layer, and an anode layer.
- 1 3. The solid-state battery of claim 2 wherein (i) the electrolyte layer is disposed proximate  
2 the cathode layer, the electrolyte layer having a first surface contacting the cathode layer; and (ii)  
3 the anode layer is disposed proximate the electrolyte layer, the anode layer contacting a second  
4 surface of the electrolyte layer.
- 1 4. The solid-state battery of claim 2 wherein the electrolyte comprises silicon dioxide.
- 1 5. The solid-state battery of claim 4 wherein the electrolyte is substantially free of lithium.
- 1 6. The solid-state battery of claim 4 wherein the electrolyte layer has a thickness less than  
2 about 100 nm.
- 1 7. The solid-state battery of claim 2 wherein at least one of the anode and cathode  
2 comprises silicon.
- 1 8. The solid-state battery of claim 2 wherein at least one of the anode and the cathode  
2 comprises lithium.
- 1 9. The solid state battery of claim 8 wherein at least one of the anode and the cathode  
2 comprises at least one of a lithium-metal alloy, a III-V compound, a II-VI compound, a nitride,  
3 lithium intercalated into graphite, and an oxide.
- 1 10. The solid-state battery of claim 9 wherein at least one of the anode and the cathode  
2 comprises at least one of  $\text{Li}_{22}\text{Sn}_5$ ,  $\text{LiCoO}_2$ , titanium nitride, nickel silicide, cobalt silicide,  
3 titanium oxide, and a transition metal oxide.

- 1 11. The solid-state battery of claim 2 wherein the cathode layer has a thickness less than  
2 about 500 nm.
- 1 12. The solid-state battery of claim 2 wherein the anode layer has a thickness less than about  
2 500 nm.
- 1 13. The solid-state battery of claim 1 wherein the stacked layers are formed on a substrate,  
2 and at least a portion of the substrate comprises at least a portion of the solid-state battery.
- 1 14. The solid-state battery of claim 13 wherein the substrate comprises an anode.
- 1 15. The solid-state battery of claim 13 wherein the substrate comprises a cathode.
- 1 16. The solid-state battery of claim 1 wherein the battery is integrated within and operatively  
2 connected to an integrated circuit defined on the substrate.
- 1 17. The solid-state battery of claim 1, further comprising:  
2 a contact layer disposed over the battery.
- 1 18. A method for forming a solid-state battery, comprising the steps of:  
2 forming a plurality of thin film layers over a substrate; and  
3 patterning the plurality of thin film layers to define the solid-state battery,  
4 wherein the solid-state battery has a thickness less than approximately 1  $\mu\text{m}$ .
- 1 19. The method of claim 18 wherein the plurality of thin film layers includes a cathode layer,  
2 an electrolyte layer, and an anode layer.
- 1 20. The method of claim 19 wherein the electrolyte layer comprises silicon dioxide.
- 1 21. The method of claim 20 wherein forming the electrolyte layer comprises at least one of  
2 dry oxidation and wet oxidation.
- 1 22. The method of claim 20 wherein the electrolyte layer has a thickness less than  
2 approximately 500 nm.
- 1 23. The method of claim 18 wherein forming the layers comprises sputtering.

- 1 24. The method of claim 18 wherein forming the layers comprises chemical vapor  
2 deposition.
- 1 25. The method of claim 18 wherein patterning the layers comprises photolithography.
- 1 26. The method of claim 18 wherein patterning the layers comprises etching.
- 1 27. The method of claim 18 wherein the solid-state battery is integrated within and  
2 operatively connected to an integrated circuit disposed on the substrate
- 1 28. A solid-state battery, comprising:  
2 a plurality of stacked thin film layers,  
3 wherein the solid-state battery is at least partially integrated within the stacked thin film  
4 layers, the stacked thin film layers comprise an electrolyte layer and the electrolyte layer has a  
5 thickness of less than about 100 nm.
- 1 29. The solid-state battery of claim 28 wherein the stacked thin film layers further comprise a  
2 cathode layer and an anode layer.
- 1 30. The solid-state battery of claim 29 wherein (i) the electrolyte layer is disposed proximate  
2 the cathode layer, the electrolyte layer having a first surface contacting the cathode layer; and (ii)  
3 the anode layer is disposed proximate the electrolyte layer, the anode layer contacting a second  
4 surface of the electrolyte layer.
- 1 31. The solid-state battery of claim 29 wherein the electrolyte comprises silicon dioxide.
- 1 32. The solid-state battery of claim 29 wherein the electrolyte is substantially free of lithium.
- 1 33. The solid-state battery of claim 31 wherein the electrolyte layer has a thickness less than  
2 about 10 nm.
- 1 34. The solid-state battery of claim 29 wherein at least one of the anode and cathode  
2 comprises silicon.
- 1 35. The solid-state battery of claim 29 wherein at least one of the anode and the cathode  
2 comprises lithium.

- 1 36. The solid state battery of claim 35 wherein at least one of the anode and the cathode  
2 comprises at least one of a lithium-metal alloy, a III-V compound, a II-VI compound, a nitride,  
3 lithium intercalated into graphite, and an oxide.
- 1 37. The solid-state battery of claim 36 wherein at least one of the anode and the cathode  
2 comprises at least one of  $\text{Li}_{22}\text{Sn}_5$ ,  $\text{LiCoO}_2$ , titanium nitride, nickel silicide, cobalt silicide,  
3 titanium oxide, and a transition metal oxide.
- 1 38. The solid-state battery of claim 29 wherein the cathode layer has a thickness less than  
2 about 500 nm.
- 1 39. The solid-state battery of claim 29 wherein the anode layer has a thickness less than  
2 about 500 nm.
- 1 40. The solid-state battery of claim 28 wherein the stacked layers are formed on a substrate,  
2 and at least a portion of the substrate comprises at least a portion of the solid-state battery.
- 1 41. The solid-state battery of claim 40 wherein the substrate comprises an anode.
- 1 42. The solid-state battery of claim 40 wherein the substrate comprises a cathode.
- 1 43. The solid-state battery of claim 28 wherein the battery is integrated within and  
2 operatively connected to an integrated circuit defined on the substrate.
- 1 44. The solid-state battery of claim 28 further comprising:  
2 a contact layer.
- 1 45. A method for forming a solid state battery, comprising the steps of:  
2 forming a plurality of thin film layers over a substrate, and  
3 chemical mechanical polishing at least one of the thin film layers.
- 1 46. A method for forming a solid-state battery, comprising the steps of:  
2 forming a plurality of thin film layers over a substrate; and  
3 patterning the plurality of thin film layers to define the solid-state battery, the solid-state  
4 battery including an electrolyte layer,

- 5            wherein the electrolyte layer has a thickness of less than about 100 nm.
- 1    47.    The method of claim 46 wherein the plurality of thin film layers includes a cathode layer  
2    and an anode layer.
- 1    48.    The method of claim 46 wherein the electrolyte layer comprises silicon dioxide.
- 1    49.    The method of claim 48 wherein forming the electrolyte layer comprises at least one of  
2    dry oxidation and wet oxidation.
- 1    50.    The method of claim 48 wherein the electrolyte layer has a thickness less than  
2    approximately 10 nm.
- 1    51.    The method of claim 46 wherein forming the layers comprises sputtering.
- 1    52.    The method of claim 46 wherein forming the layers comprises chemical vapor  
2    deposition.
- 1    53.    The method of claim 46 wherein patterning the layers comprises photolithography.
- 1    54.    The method of claim 46 wherein patterning the layers comprises etching.
- 1    55.    The method of claim 46 wherein the solid-state battery is integrated within and  
2    operatively connected to an integrated circuit disposed on the substrate
- 1    56.    The method of claim 46 wherein at least one of the thin film layer comprises polysilicon.
- 2    57.    A solid-state battery, comprising:  
3            a thin solid electrolyte layer,  
4            wherein the electrolyte layer comprises an initial state and an operative state, the  
5    electrolyte layer in the initial state is substantially free of ions, and ions conduct through the  
6    electrolyte layer in the operative state during operation of the battery.